Grade 5 – Mathematics

The **academic expectations** addressed by the open-response item "Making a Quilt" are:

1.5-1.9 Students use mathematical ideas and procedures to communicate, reason, and solve problems.

2.9   Students understand space and dimensionality concepts and use them appropriately and accurately.

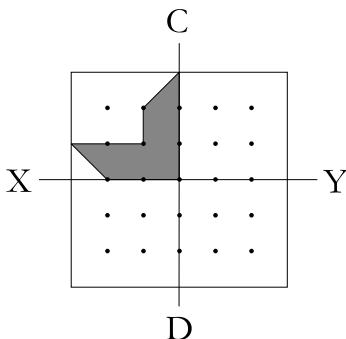The **core content** addressed by this item includes:

MA-E-2.1.4   Geometry/Measurement (Concepts): Symmetry, congruence, and similar figures

MA-E-2.2.2   Geometry/Measurement (Skills): Use of symmetry to construct a geometric design

Making a Quilt

Alene and her grandmother are making a quilt using quilt squares of different symmetrical patterns.
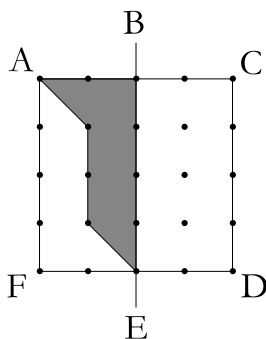
a. ACDF is one quilt square they are using. Copy the whole quilt square into the top half of the grid in your Student Response Booklet. The line segment BE is a line of symmetry. ABEF is the left half of the quilt square. Draw the design that belongs in the right half of this square (BCDE).

b. Another quilt square they are using is shown below. A design is shown in 1/4 of the quilt square. Copy the whole quilt square shown below into the bottom half of the grid in your Student Response Booklet. The line segments CD and XY are lines of symmetry. Draw the design that belongs in the other three parts of the quilt square.
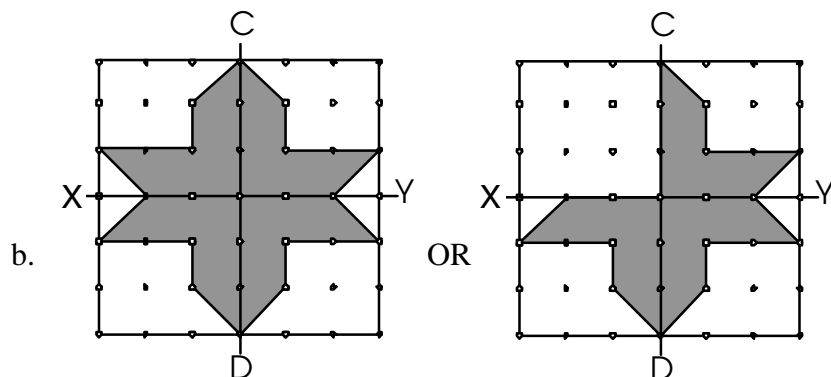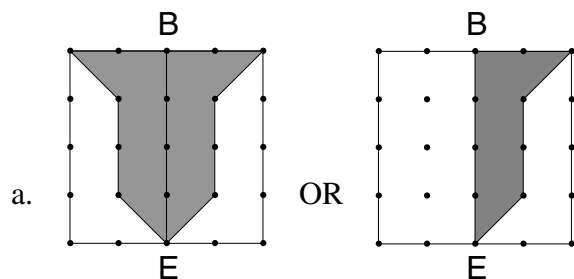
Score	Description
4	Response has accurate drawings for part a and part b (i.e., the other half of part a and the other three-quarters of part b are symmetrical designs).
3	Response has an accurate drawing for either part a or part b with a partially correct drawing showing symmetry in the other part.
2	Student attempts to draw the symmetrical design that completes both squares, but neither design is completed accurately. Student response shows limited ability to use symmetry. **OR** Student response shows correct figure in part a only. **OR** Student response shows correct figure in part b only.
1	Response shows minimal understanding of symmetry.
0	Response is totally incorrect or irrelevant.
Blank	No response.

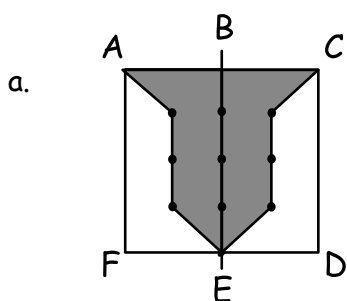Note: Part b must show symmetry across both axes for a score of 4 or 3.

Answers:

a.　　　OR

b.　　　OR
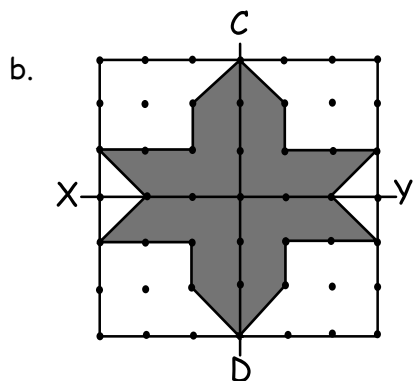
Sample Student Response Scored a 4
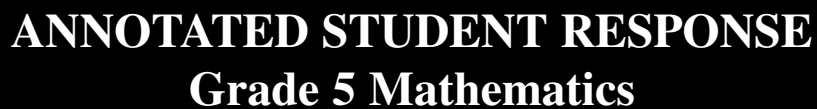
Student Response

a.

Student's response to part a accurately represents the other half of the symmetrical design.

b.

Student's response to part b accurately represents the other three-quarters of the symmetrical design.

Overall, the student demonstrates a strong understanding of symmetry and a strong ability to use symmetry to construct a symmetrical design. Student accurately completes two symmetrical designs, one of which requires symmetry across both axes.

Sample Student Response Scored a 4

Student Response

a.

A   B   C

The design that goes on the right side is   (BCDE)

F   E   D

Student's response to part a accurately represents the other half of the symmetrical design.

b.

C

The design that goes in the other parts are these

X   y

D

Student's response to part b accurately represents the other three-quarters of the symmetrical design.

Overall, the student demonstrates a strong understanding of symmetry and a strong ability to use symmetry to construct a symmetrical design. Student accurately completes two symmetrical designs, one of which requires symmetry across both axes.
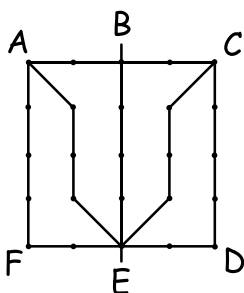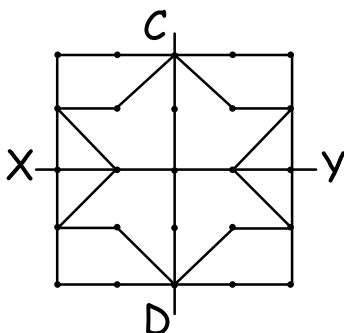
Sample Student Response Scored a 3

Student Response

A.

You can finish these by just following the dots that the first example shows you. If no dots are there then you just try your best.

Student's response to part a accurately represents the other half of the symmetrical design.

Student's response to part b is partially accurate. Response shows symmetry across both axes.

Overall, the student demonstrates a general understanding of symmetry and a general ability to use symmetry to construct a symmetrical design. The student accurately completes the symmetrical design in part a; the completed symmetrical design in part b is partially correct.
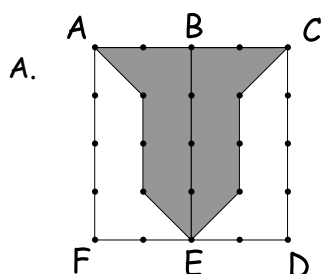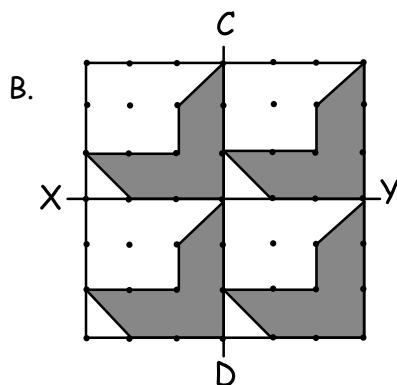
Sample Student Response Scored a 2

Student Response

A.

Student's response to part a accurately represents the other half of the symmetrical design.

B.

Student's response to part b is incorrect (i.e., does not accurately represent the other three-quarters of the symmetrical design).

Overall, the student demonstrates some understanding of symmetry and some ability to use symmetry to construct a symmetrical design. The student accurately completes the symmetrical design in part a but is unable to complete the symmetrical design in part b.
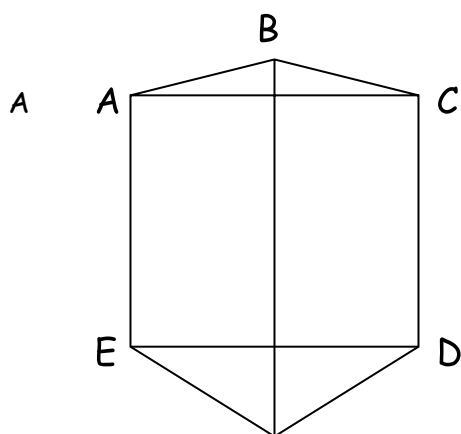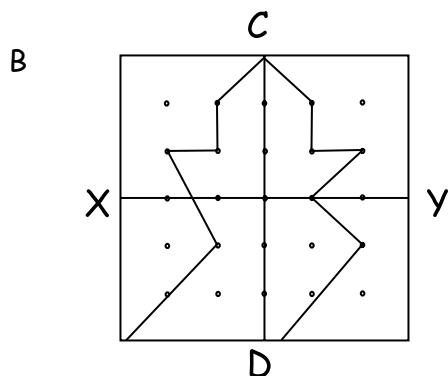
Sample Student Response Scored a 1

Student Response

B

A   A   C

E   D

Student's response to part a is incorrect.

C

B

X   Y

D

Student's response to part b is somewhat correct.

Overall, the student demonstrates minimal understanding of symmetry and minimal ability to construct a symmetrical design. The student's response to part a is incorrect; the response to part b is somewhat correct.

The open-response item "**Making a Quilt**" was designed to address students' (1) understanding of space and dimensionality concepts, and (2) ability to use the concept of symmetry to draw a geometrical design. The instructional strategies below present ideas for helping students explore and master these concepts and skills.

Review the concept of symmetry.

Show examples of symmetry in magazines, wrapping paper, buildings, and nature.

Using mirrors and other reflection devices, show students reflected designs and discuss the line(s) of symmetry.

Provide opportunities for students to work individually, in pairs, in small groups, and/or as a class to complete (with teacher guidance and support) any or all of the following activities:

- Identify and describe symmetrical designs.

- Draw symmetrical designs.

- Identify the line(s) of symmetry in designs.

- Draw polygons and designs on grid paper and find line(s) of symmetry.

- Copy designs from magazines, cards, and textbooks.

- Explore rotating letters, pictures, and figures to see if there are lines of symmetry.

- Fold paper to make symmetrical shapes.